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THE HOURS OF WORK IN RELATION TO QUALITY OF OUTPUT.[1]

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The quality of the work in the various hours of the day is of interest both from the physiologic and economic standpoint. Industrially, deterioration of the quality of the work means lost labor, and, in some cases, loss of materials. The selection of industrial jobs for the study of this question must be made with extreme care, since there are many factors other than the hours of work which must be taken into account. Briefly, there must be constancy in the various mechanical aspects of the job throughout the day, including tools, machine speed, raw material, lubrication, transportation, and machine processing. The operator's speed and lost time must be taken into account, and also the environmental conditions, as, for example, lighting and distraction. Also the method of inspection to detect spoiled work must not be influenced by the fatigue of the inspector.

Three jobs were carefully studied hour by hour throughout the day as regards the hourly output, the lost time, both voluntary and involuntary, and the number of errors or the number of pieces of spoiled or defective work. Briefly, the three jobs may be described as follows:

The footpress job consisted of stamping, by means of a footpress, a small rivet in a piece of wire gauze which was held in place in a metal shell. A stripper removed the shell when the footpress was released. If the shell remained under the edge of the stripper, it was the duty of the operator to knock it away. Failure to do this resulted in crushing the shell in the next operation. The second job, threading tube, consisted of grasping a tube about 1 inch in diameter and 5 inches long, and inserting it on a steel mandrel. A tool then came down rolling a thread upon the end. Differences in the quality of the work would be manifest by failure of the operator to get the tube on the mandrel or to remove it on the first trial. The third operation consisted of grinding a flat surface on the two ends of a short spiral spring. The grinding was done on an emery wheel, and spoiled work resulted if the spring was ground either too little or too much. In the three jobs there was an enormous difference in both the daily and the relative hour-by-hour percentages of scrap.

[1] Abstract of a paper which was presented at the meeting of the American Physiological Society, Chicago, Ill., Dec. 28, 1920.

These divergent results not only emphasize the differences to be found in industrial operations, but strongly indicate the need for some analysis and common classification which may throw more light upon these differences. The basis for such an analysis must obviously be physiological. A more detailed consideration of the physiologic analysis of industrial operations will appear elsewhere, and in the present connection only the essentials which apply to our present study will be given.

The principle employed has been to analyze the job in terms of the receptor stimulus and effector response. The footpress job, for example, involves as regards spoiled work, only the visual receptor, whereas in the other two jobs both the visual and deep receptors are used. The first job then employs a single receptor while the latter two employ multiple receptors. Since the outflow for both receptors is along the same effector path, both of these jobs may be considered as allied reflexes. However, there is this difference: In the threading tube operation both visual and deep receptors are stimulated simultaneously, whereas in the grinding spring operation these receptors are stimulated successively, resulting in a delay after the visual stimulus.

In addition to the number of receptors we must take into account the quantitative value of the stimulus. This may be best expressed in terms of the liminal value for the given receptor. We may thus designate the value of the stimulus as 1, 2, 3, etc., depending upon whether it is just the liminal value or 2, 3, etc., times the liminal value. We have called this the fineness of discrimination. Of the jobs studied that in which the discriminations are finest for both receptors is the grinding of the springs; threading tube ranks next and footpress work last. In addition to the fineness of discrimination, we must obviously take into account the number of sensory patterns for the given receptor. The character of these patterns may vary in spatial configuration, in time relations, or in intensity. In these three jobs the number of patterns is low, although in many jobs it is high.

On the effector side we may analyze the muscle group which reacts, the response lag, the percentage of effective tension (obtained by dividing the tension produced by the absolute contractile force), the tension time, the rest dilution (including massed rest, rest in the operating cycle, and total rest for the day), the number of discriminations for the working period, etc.

This analysis reveals that our three jobs are vastly different from the physiological standpoint. Where a single receptor is employed, with a relatively strong stimulus, as in the footpress job, the percentage of scrap is low and is practically uniform throughout the day. Where two receptors are employed, as in grinding springs

and rolling thread, a rise in the percentage of scrap occurs toward the end of the spell, the highest two-hour period being the last two hours of the day. Grinding springs differs from rolling thread in that there is delay interposed after the visual stimulus, and in that the discriminations are finer. This job shows the highest percentage of scrap for the day and a different hourly curve. The scrap is high in the beginning of each spell and decreases during the first three hours of each spell. In the rolling thread operation, on the other hand, the percentage of scrap is low at the beginning of the spell and rises practically continuously throughout the spell. An analysis of the evidence at hand leads us to believe that the shape of these curves is not due to hourly differences in the environment or the work.

Space here does not permit of a presentation of the detailed statistical tables that have been made of the spoiled work in these jobs.

NATIONAL HEALTH LEGISLATION OF INTEREST TO WOMEN.[1]

By Lydia Allen DeVilbiss, Surgeon (R), United States Public Health Service.

Conservation of human life and health has been woman's instinct since the world began. I count it, therefore, a privilege to bring before this assembly of women a few items of health legislation of immediate importance, prepared by the authority of the United States Public Health Service.

The United States Public Health Service stands in much the same relation to the Nation as the State and city departments of health to their respective States and municipalities. Among other matters affecting health, the powers and duties of the United States Public Health Service include prevention of introduction of disease from foreign countries into the United States at ports of entry; control of interstate spread of disease; suppression of epidemics; research in diseases of man; making information on health matters available to the general public; working with city and State departments of health so as to bring to the solution of a public health problem the combined services of national, State, and city health authorities, and, what is extremely important, thereby to strengthen and to develop city and State health departments. Working largely in this way, the Public Health Service has not come into direct relation with any considerable number of citizens and, consequently, its work hitherto has not been well known outside of the public health professions.

During the war the Public Health Service undertook intensive health work in the extra-cantonment zones and among the civilian

[1] Address delivered at the Convention of the National Woman's Party, Washington, D. C., February 17, 1921.